WHAT IS CLAIMED IS:

Claims:

1. Apparatus for manufacturing molded products to have protection against electromagnetic interference, radio frequency interference and/or electrostatic discharge, said apparatus comprising:

a fixture;

a shaping apparatus for shaping a mesh blank on said fixture into a mesh insert; and

a robot for removing the shaped mesh insert from the fixture, transferring the insert to a molding machine, and placing the insert on a mold core of the machine in preparation for a molding operation in which the mesh insert is molded into a molded product to provide said protection.

2. The apparatus as set forth in claim 1 further comprising:

a feeding apparatus for feeding a web of mesh to a stamping station; and

a press at the stamping station for cutting the blank of mesh from the web, said feeding apparatus thereafter being operable to transfer the blank to said fixture.

3. Apparatus as set forth in claim 2 further comprising a plurality of said fixtures and a forming apparatus comprising a rotatable hub having a plurality of spokes radiating out from the hub at spaced intervals around the hub, each spoke carrying at least one of said fixtures, said hub being rotatable to progressively index each fixture from said blank-receiving station to a shaping station at which said shaping apparatus is located and to a loading station at which said robot removes the mesh insert from the fixture.

4. Apparatus as set forth in claim 3 further comprising feeding apparatus for feeding a web of mesh to a stamping

station and a press at the stamping station for cutting said blank of mesh from the web, said feeding apparatus thereafter being operable to place the blank on said fixture at a blank-receiving station.

5. The apparatus set forth in claim 4 wherein said feeding apparatus is operable to move the blank from the stamping station to the blank-receiving station while the trailing end of the blank is still connected to the raw web, and wherein the press is operable thereafter to sever the connection between the blank and the web.

6. The apparatus of claim 4 wherein the apparatus further comprises a programmable computer control system operable to control movement of the feeding apparatus, press, shaping apparatus, and robot, said control system being capable of being programmed to form a plurality of differently shaped mesh inserts.

7. The apparatus of claim 6 further comprising a plurality of sensors operable to send signals to the control system to signal that the apparatus has successfully completed transfer of a blank to the blank-receiving station, placement of a blank on the fixture, shaping the blank into a mesh insert, transfer of the mesh insert to a mold machine, and placement of the mesh insert on the mold core.

8. The apparatus of claim 1 further comprising a pair of locator pins extending up from the fixture for reception in a pair of holes in a mesh blank to properly locate the mesh blank on the fixture.

9. Apparatus as set forth in claim 1 wherein the fixture is equipped with magnets for holding the blank in place on the fixture.

10. Apparatus as set forth in claim 1 wherein the fixture is equipped with a sensor for sensing the correct position of the blank on the fixture.

11. The apparatus set forth in claim 1 wherein the shaping apparatus comprises one or more shaping members for bending the blank into a mesh insert.

12. The apparatus of claim 11 wherein said one or more shaping members are operable to bend a first part of the blank to form a tab and thereafter to bend a second part of blank to overlie the tab.

13. Apparatus as set forth in claim 11 wherein said shaping apparatus comprises a pair of end shaping members for bending end flaps of the blank to form end walls of the mesh insert, and a pair of side shaping members for bending side flaps of the blank to form side walls of the mesh insert.

14. Apparatus as set forth in claim 13 wherein said shaping apparatus further comprises tab shaping members for bending opposite side edge portions of the end walls to form corner tabs which tuck inside the side walls of the insert.

15. Apparatus as set forth in claim 13 wherein said shaping apparatus further comprises tab shaping members for bending opposite side edge portions of the side walls to form corner tabs which tuck inside the end walls of the insert.

16. Apparatus as set forth in claim 13 wherein said shaping apparatus further comprises at least one moveable push rod for moving a first part of the mesh blank out of the way to allow the shaping apparatus to bend a second part of the mesh blank.

17. Apparatus as set forth in claim 1 wherein said robot is operable to transfer said molded product away from the molding machine following completion of a molding operation.

18. Apparatus as set forth in claim 17 wherein the robot has an arm with a holding tool comprising a first holder for holding a mesh insert to be transferred to the molding machine, and a second holder for holding a molded product to be transferred away from the molding machine.

19. Apparatus as set forth in claim 18 wherein the first holder comprises a base and an array of electromagnets attached to the base and arranged to define a cavity for holding a mesh insert with the magnets in contact with the mesh insert.

20. Apparatus as set forth in claim 18 wherein the second holder comprises a pair of parallel plates spaced for receiving a molded product therebetween and at least one suction device between the plates.

21. A tool for use by a robot to transfer mesh inserts to a molding machine and to transfer molded products containing the mesh inserts away from a molding machine, said tool comprising:

a base;

a mesh insert holder attached to the base; and

a molded product holder attached to the base.

22. The tool set forth in claim 21 wherein the mesh insert holder comprises an array of magnets arranged to form a cavity that is shaped to receive a mesh insert.

23. The tool set forth in claim 21 wherein the molded product holder comprises a plurality of plates extending from

the base, said plates being spaced apart to allow a molded product to be received between the plates, and at least one vacuum cup holder for holding the molded product.

24. The tool set forth in claim 23 wherein the mesh insert holder comprises an array of magnets arranged to form a cavity that is shaped to receive a mesh insert.

25. The tool set forth in claim 24 wherein the magnets comprise electromagnets that can be selectively energized for picking up a mesh insert and de-energized for releasing a mesh insert.

26. The tool set forth in claim 25 wherein the magnets comprise electromagnets that can be selectively energized for picking up a mesh insert and de-energized for releasing a mesh insert.

27. A method of manufacturing molded products to have protection against electromagnetic interference, radio frequency interference and/or electrostatic discharge, said method comprising:

automatically shaping a mesh blank on a fixture to form a shaped mesh insert;

operating a robot to (1) remove the mesh insert from the fixture, (2) transfer the insert to a molding machine, and (3) place the insert on a mold core of the machine in preparation for a molding operation in which the insert is molded into a molded product.

28. A method as set forth in claim 27 further comprising molding the insert into a molded product.

29. A method as set forth in claim 28 further comprising operating the robot to remove the molded product

from the mold core and to transfer the product to a molded product receiving station.

30. A method as set forth in claim 27 further comprising:

automatically feeding a web of mesh to a stamping station;

automatically cutting a blank of mesh from the web at the stamping station;

automatically transferring the blank of mesh to a blank-receiving station and placing the blank on said fixture at the blank-receiving station;

automatically shaping the blank on the fixture to form a shaped insert; and

automatically transferring the shaped insert from the fixture to a molding machine using a robot.

31. A method as set forth in claim 30 further comprising molding the insert into a molded product and operating the robot to remove the molded product from the molding machine and transfer it to a molded product receiving station.

32. A method as set forth in claim 30 wherein said fixture is mounted on a spoke radiating out from a rotatable hub, said method further comprising rotating the hub to progressively index the fixture from said blank-receiving station to a shaping station where said automatic shaping of the blank occurs, and then rotating the hub to move the fixture to a loading station for removal of the insert from the fixture by said robot.

33. A method as set forth in claim 30 wherein the step of placing the blank on a fixture comprises aligning a pair

of holes in the blank to fit over a pair of locator pins to properly locate the blank on the fixture.

34. A method as set forth in claim 30 further comprising energizing an electromagnet to hold the blank in position on the fixture.

35. A method as set forth in claim 30 wherein the step of shaping the blank comprises bending the blank on the fixture.

36. A method as set forth in claim 30 wherein the step of shaping the blank further comprises bending a part of the blank to form a tab and thereafter bending a second part of the blank to overlie the tab.

37. A method as set forth in claim 36 wherein the step of bending the blank to form a tab further comprises moving a part of the blank out of the way to allow bending of the tab.

38. A method as set forth in claim 30 wherein the step of shaping the blank comprises forming at least one flange.